

are much longer, their extremities are broken, and it is difficult to ascertain their length.

As constituents of these fibres may be distinguished a contractile substance remarkable for its intense coloration and its homogeneous aspect, and a nucleus accompanied by a protoplasmic substance. The existence of an enveloping membrane seems doubtful; the author thinks that in most cases there is none, and at the utmost it is only at the level of the nucleus that one can detect a delicate hyaline pellicle, which seems to keep the nucleus in contact with the element to which it belongs; but this rudimentary membrane soon disappears in contact with the muscular substance.

When these fibres are lamellar one margin is always thicker than the other, their form being like that of a sword-blade with a straight thick edge, while the thin edge is notched and furnished with irregular processes.

The contractile substance of these muscles is perfectly homogeneous, and in most cases it is impossible to discover transverse or longitudinal striæ. Some, however, present a peculiar aspect, which might seem to indicate a coarse transverse striation; colouring reagents, especially hæmatoxyline, show alternate light and dark segments, which give the fibre a banded rather than a striated appearance; and it is easy to see that these false striations represent actual thickenings of the muscular substance, and must be regarded as waves of contraction, having nothing in common with the transverse striæ of the Arthropoda and Vertebrata. In a Tubicolar Annelid (*Protula intestinum*, Lam.), which is remarkable for the dimensions and lamellar form of the longitudinal fibres of the posterior region of the body, the author has, however, found a true striation, comparable by its fineness and regularity to that of the muscles of Mammalia. This striation is manifested chiefly in the dark regions of the fibre; and while its general direction is transverse, it varies according to the point examined, so that the striæ may become more or less oblique. The striæ appear to be grouped in areas in which their direction varies more or less. They are very fine.

The author thinks that this striation in *Protula intestinum* is not unique; but he regards its occurrence here as particularly interesting, as it is in relation to the rapidity of contraction which occurs in *Protula*.

The nucleus is oval and placed outside the mass of contractile substance. The protoplasm surrounding it is sometimes very abundant and accompanies the muscular fibre through a great part of its length; but generally it is reduced to small granular masses which surround the nucleus and form irregular ridges upon the edge of the fibres.—*Comptes Rendus*, March 14, 1887, p. 795.

The Stigmata of the Scolopendridæ. By Dr. ERICH HAASE.

The number and structure of the stigmata is of great importance in the classification of the very uniform family of the Scolopendridæ. Thus Newport distinguished fissiform, cribriform, and so-called

“branchiform” stigmata. These “branchiform” stigmata he defined * as “spiracula circularia, membrana braniformi corrugata intus vestita,” and von Porath, in establishing the genus *Otostigma* (= *Branchiostoma*, Kohlr.), also accepted this definition †. But Kohlrausch ‡ indicated that he could not find any resemblance to branchiæ in these stigmata, although he adhered to the opinion that the stigmata are *closed* from within by a branchiform membrane.

In working up the Indo-Australian Chilopoda, the results of which I shall shortly publish in a larger memoir, I was led to investigate the structure of the stigmata, which I studied particularly in tangential sections.

The simplest form is the apertural stigma, which occurs in *Lithobius* and *Henicops*, and has been fully described by me §. It is characterized by the undeveloped peritrema, by a rather short calyx, lined within with a lattice-work of setæ, and destitute of special protective apparatus, and by the cylindrical tracheæ which open simply. A similar form occurs in the young (*fœtus*, Ltz.) of the Scolopendridæ, which, after quitting the egg, lie motionless for a considerable time, and are covered by the body of the mother, in *Scolopendra* as well as in *Heterostoma*. Thus this simple form constitutes the common starting-point of the fissiform and cribriform stigmata.

In *Cryptops* the fundamental form is very distinctly marked, while in *Cormocephalus* it already leads towards the stigma of the true *Scolopendracæ* by the more fissiform and margined external orifice, and by the accession of simple circlets of spines before the opening of the tracheæ. In the *Scolopendracæ* the stigmatic cavity is divided into an exterior vestibule and the true calyx, and the circlet of spines before the direct opening of the tracheæ attains its highest development.

The ear-shaped (=branchiform) stigma of *Otostigma*, v. Por., and *Branchiostoma*, Newp., may be derived from the apertural stigma by regarding the calyx as obliquely compressed for a small portion of its length. On the floor of the stigma in these forms a few irregular dark-coloured islands make their appearance, and these are beset externally with the small hooklets which are so frequent in the stigmatic calices of the Chilopoda. These islands are the remains of the original floor of the stigma, while the clear straits surrounding them are formed by the gradually flattened and dilated debouching surfaces of the tracheæ. The external aperture of the ear-shaped stigmata is round and finely denticulated at the margin; there is no projecting ring as in *Scolopendra*.

* Newport, “Monograph of the . . . Chilopoda,” Linn. Trans. vol. xix. p. 411.

† O. von Porath, Bihang till K. Sv. Vet.-Ak. Handl. Bd. iv. no. 7 (1876), p. 19.

‡ Kohlrausch, ‘Beiträge zur Kenntniss der Scolopendriden’ (Maringburg, 1878), p. 6.

§ E. Haase, “Das Respirations-system der Symphylen und Chilopoden,” in Zool. Beiträge, Bd. i. p. 76 (Breslau, 1884).

From this ear-shaped stigma the *cribriform* stigma (such as that of *Heterostoma*) may be derived by imagining the floor-surface of the stigmatic calyx to be considerably enlarged, the tracheæ narrowed and multiplied, and the distance between the margin of the stigma and the floor of the calyx suppressed.

Although the first pair of stigmata of *Heterostoma*, which may attain a diameter of 4 millim., even projects above the plane of the body-surface, the last stigmata exhibit a depression of the calyx &c. such as is typical of *Branchiostoma*, and thus, as the least developed, prove clearly that the ear-shaped stigma preceded the cribriform.

I have not found any transition form between the fissiform and the ear-shaped stigmata.

To the embryonic characters of the stigma in the young Scelopendridæ must be added a peculiar one, hitherto unmentioned. Each stigma is protected by a strong hook-like chitinous process of some breadth (up to 2 millim.), which is inclined over the aperture, and is to be regarded as a duplication of the pleura. This peculiar protective apparatus, which does not occur in the embryos of *Lithobius*, must, as foetal, be contrasted with the embryonic form of the stigma, which is so significant in developmental history. It is therefore to be regarded as secondary, adapted to special conditions of life, and probably produced, like the peculiar brooding, by the tenderness and helplessness of the delicate embryos.—*Zool. Anz.* no. 246, March 14, 1887, p. 140.

On the Food of the *Sardine*.

By MM. G. POUCHET and J. DE GUERNE.

The authors have examined the contents of the intestine of numerous sardines obtained from various places on the shores of the Bay of Biscay, including materials collected at the Laboratory of Concarneau. They say:—

“At Concarneau the stomachs of sardines captured on 17th June, 1882, contain only Copepoda belonging to the largest species of the European seas—*Pleuromma armata*, Boeck, and *Calanus finmarchicus*, Gunner*. These are pelagic Crustaceans, sometimes met with in considerable quantities in the open sea, but which never appear in great numbers near the shore. When they occur there in exceptional abundance they constitute what the Breton fishermen call the *boët rouge* (in Celtic, *bouéd*, food and also bait). This would exactly correspond, except, perhaps, in the identity of all the species, with the *Rödaat*, which seems to attract the summer herring (*Sommersild*) on the coasts of Norway.

“In July, August, and September, in the neighbourhood of Concarneau, our preparations show us the sardine absorbing a

* It will be noticed that all the Entomostraca here cited are indicated for the first time upon the oceanic coasts of France or Spain.